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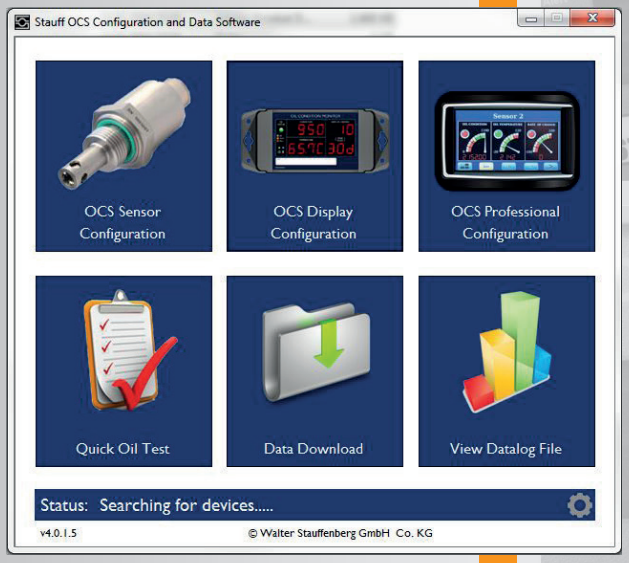


OCS-I Software

Manual

CONTENT

1. Explanation of Symbols and Notes

The following designations and symbols for dangers are used in this manual:

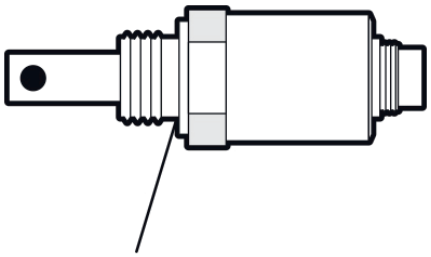
This symbol denotes safety precautions, the non-observance of which can endanger persons.

This symbol marks an important note for the proper use of the off-line unit. The non observance of these notes can lead to damage to the off-line unit.

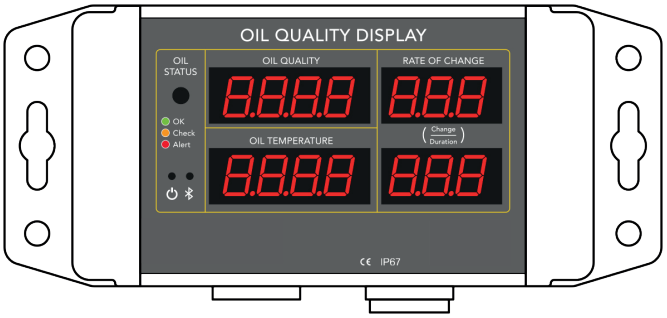
This symbol is followed by user tips and other useful information. They help you to obtain optimum function from all sections of your system.

2. Introduction

The Tan Delta Configuration and Data Software (CADS) is used to configure our core products. All of these products have a range of configurable parameters, allowing you to create a bespoke system for virtually any application.



DIN Seal



3. Measuring Oil Quality

There are a number of ways to describe oil wear and oil condition. The Tan Delta system offers three methods:

- Tan Delta Number
- Loss Factor Percentage
- Oil Quality Index

We introduced the concept of the Oil Quality Index (OQI) to create a common language for describing overall oil wear and oil condition. It makes it easier to monitor, quantify and trend oil condition and it can be combined with other methods such as ISO cleanliness levels and laboratory test results. However, we recommend that new users adopt the TDN scale as it is more intuitive.

3.1. Tan Delta Number

The Tan Delta OCSx sensor measures the Loss Factor Percentage of oil (see below). The OCS I-Display converts this into a Tan Delta Number (TDN) which is a scale running from 1200 (upper limit) to 0 (lower limit). New oil will have a value of about 0900 and the number will fall as the condition deteriorates. You can set warning and alarm levels anywhere on this scale.

When new, the Clean Point for most oils will generally be between 0950 and 0850 on the TDN scale. The actual value will depend on a number of factors but most importantly how pure the base stock is and what additive packages have been included. During use, as the oil deteriorates, TDN value will decrease.

Oil wear is not linear, it tends to follow an exponential curve, therefore any initial change in wear and/or contamination will tend to be slow, however, as the wear and/or contamination increases, the rate at which the oil degrades will increase.

The TDN does not start at 1000 for a new, clean oil, as some oils can be improved by using sophisticated on-line or off-line filtration. An oil can also improve on the TDN scale, as well as deteriorate.

3.2. Loss Factor

A clean oil has a Loss Factor Percentage of approximately 0% and then as the oil changes and degrades this Loss Factor Percentage increases. For most applications, oil would be considered to be degraded at a Loss Factor Percentage of 25% and at the "end of life" at a Loss Factor Percentage of 30% or above.

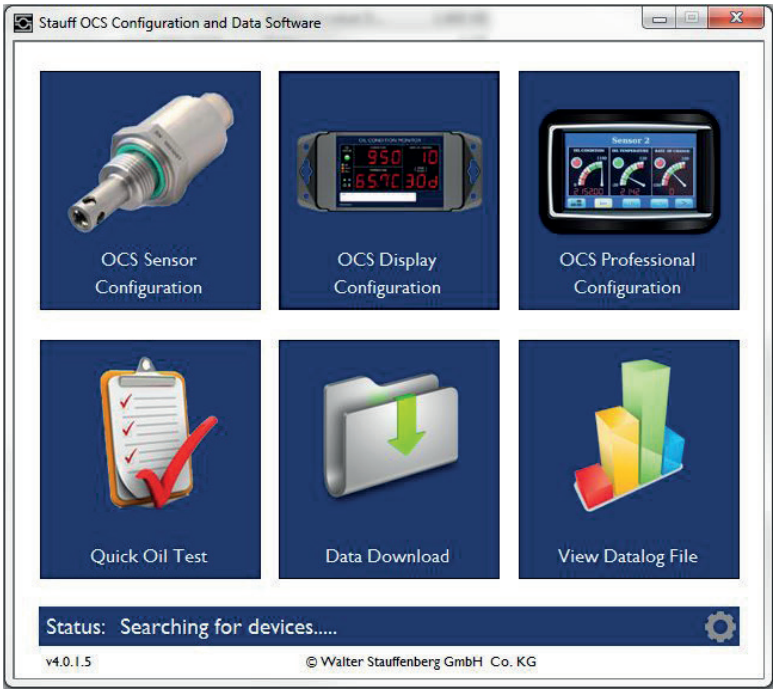
3.3. Oil Quality Index

The OQI measurement scale (-2 to +21) offers a 'traffic light' view of oil quality. There is a green section (1-13), an amber section (14-17) and a red section (18-20) to mark OK, Warning and Alarm thresholds respectively. The OQI scale is linear within the safe, green level but the amount of change reduces by half for the warning, amber level and alarm, red level. Unlike the TDN scale, the green, amber and red sections cannot be adjusted.

4. Set Up

To install the software:

1. Connect the memory stick supplied with your Tan Delta product to a USB port on your PC or laptop. Allow the PC/laptop to automatically update drivers, if needed.
2. When prompted, select Open folder to view files.
3. Launch the setup.exe file and follow the instructions in the setup wizard.
4. When prompted, click on Install.
5. When installation is complete, CADS is displayed as in Figure 4



5. Operation

5.1. Oil Database

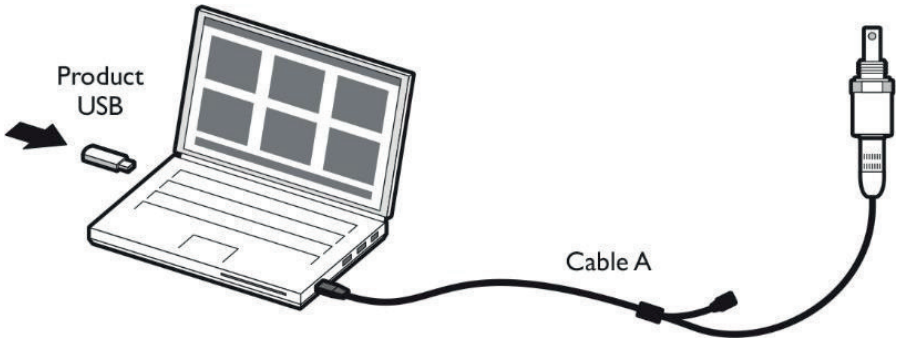
The oil database contains configuration profiles for different oils which can be programmed into any sensor. The software comes pre-loaded with the latest version and will automatically update periodically with the new oils we have added. If you have requested for a specific oil to be profiled you may have been sent the database which will need to be loaded into the software manually.

1. From the home screen click the cog icon to bring up the settings menu and select 'Update Oil Database'.
2. Select 'OilDb.csv' from file location and upload.

5.2. Configuration

5.2.1. OCSx

First you must connect the OCSx to your computer using the configuration cable included with the sensor as shown in Figure 5.



5.2.1.1. Oil Configuration

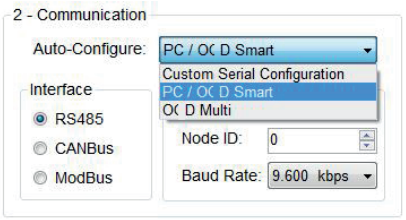
Choose the required oil profile, select from:

- Application
- Oil Base
- Manufacturer
- Oil Type
- Viscosity

5.2.1.2. Communication

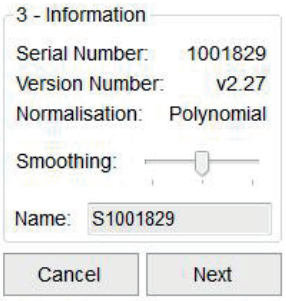
Set the communication interface.

If you are using the sensor with the Tan Delta Oil Quality Display Professional (OCS I-Display) or Oil Quality Display Express (OCS I-Display), select the appropriate option from the Auto-Configure dropdown list. Otherwise, select a protocol from the RS485, CANbus or ModBus options.



5.2.1.3. Information

Naming the sensor is optional. The name is used as an identifier for the OCS I-Display.



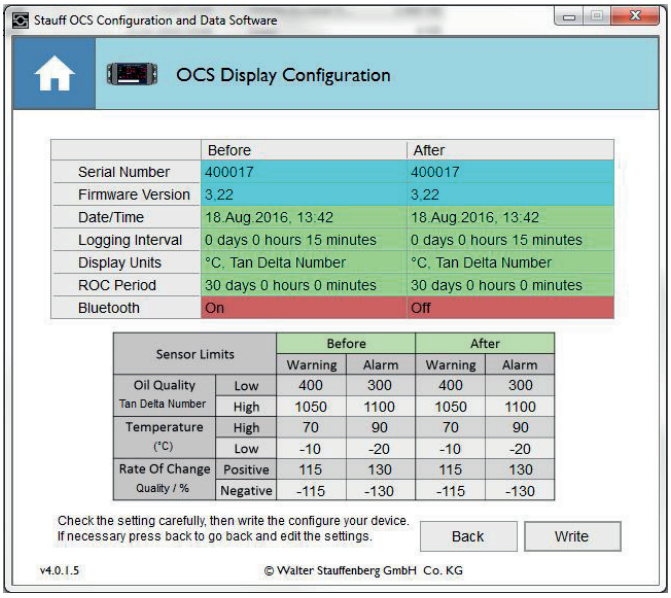
5.2.1.4. Smoothing

This function uses hysteresis to reduce the noise caused by changes in the oil such as temperature. In order for the algorithms to settle the sensor must go through at least one 'thermal cycle' of the application, this just means running the machine from standby until it reaches its highest normal operating temperature.

Available settings are Off, Low and High so you can define what level of smoothing you want. We recommend you start at Low and run the sensor in-situ for a few weeks (definitely over a few thermal cycles of the application). If the data is relatively smooth leave the smoothing at Low, if not, set to High. If data is completely static, you can turn the smoothing filter off.

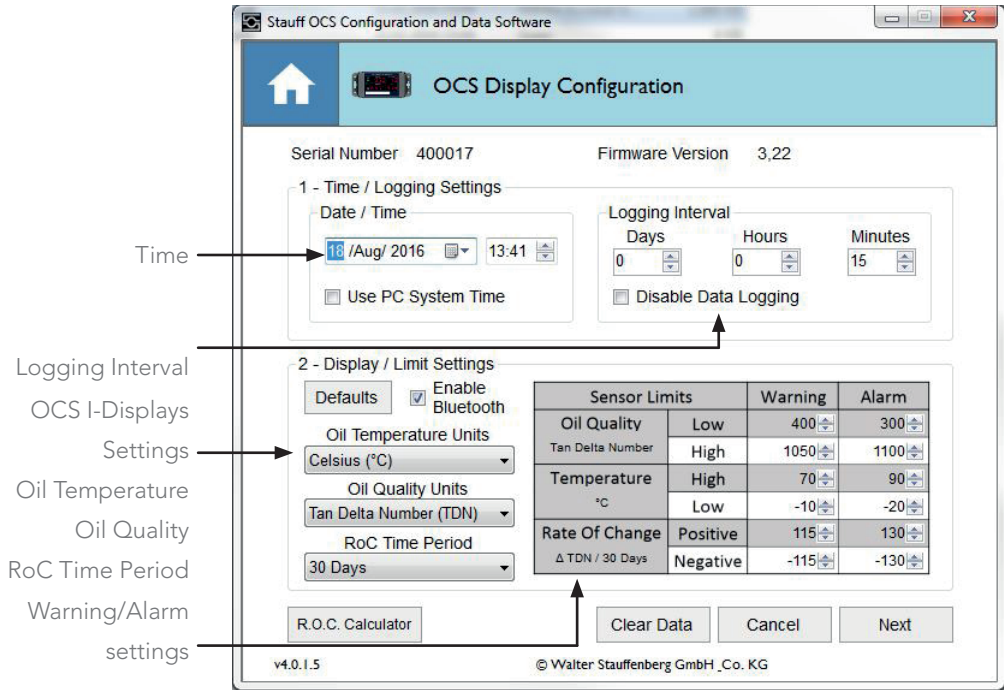
5.2.1.5. Confirming Configuration

1. When you have finished editing the sensor settings, click on the Next button.
   A summary of the configuration is shown in Figure 6.
2. Check all settings are correct and then click on the Write button.
3. A progress bar is displayed while settings are being sent to the sensors.
   'Write Successful' appears in the bottom left corner when this is finished.
4. Click on Home to return to the CADS welcome page.

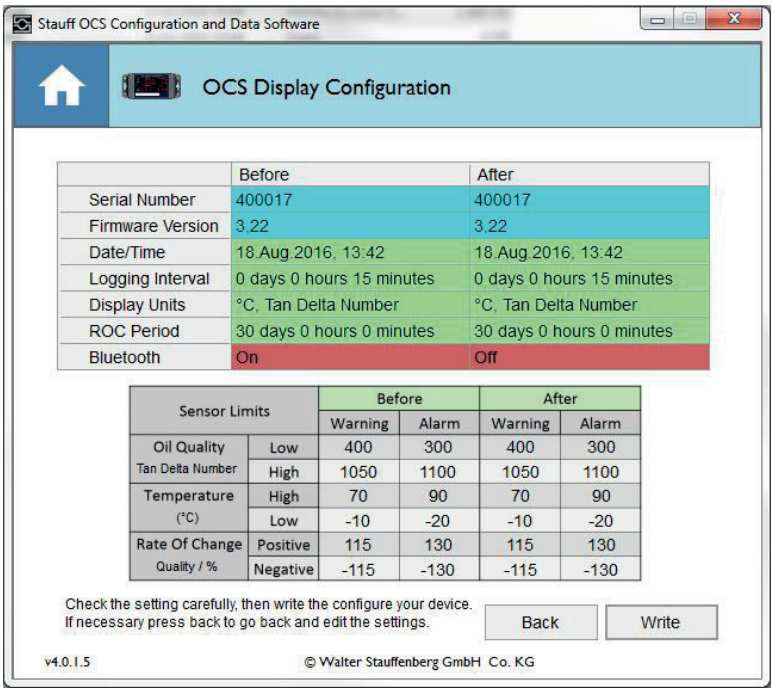


5.2.1.6. OCS I-Display

1. Click on the OCS I-Display Express Configuration button.
2. The OCS I-Display Express Configuration screen is then displayed.



3. Edit the configuration settings as required. The following section provides guidance; if you require further help, please contact your dealer.
4. When you have finished editing, click on the Next button.
5. Review the changes you have made on the Final Confirmation screen. Click on the Write button to complete the update.



5.2.1.7. Configuration Options

This section describes the various options presented on the Oil Quality Display Configuration screen.
For further information about the Oil Condition modes, see page 3.

Date/Time

Set the time for the display. This is used to time-stamp log files. You can set the time manually or take the setting from the connected PC/laptop.

Logging Interval

Determines how regularly the sensor takes a data log. You can choose from 5 minutes to 1 hour.
An appropriate interval will depend on the application and oil life.

Oil Temperature

Choose the units for the displayed temperature (°C or °F).

Oil Condition

Choose from the following three options to measure oil condition:

- Tan Delta Number
- Loss Factor
- Oil Quality Index

For further information about these Oil Condition modes, see page 3.

5.2.1.8. RoC Time Period

The rate of change calculator can allows you to enter some basic details about your oil and calculate a suitable time period and corresponding warning and alarm levels. Enter the expected life span of the oil - we take 5% of the number of hours or days the oil will last and automatically find the nearest RoC period to select, out of the following options:

- 1 day
- 7 days
- 30 days
- 60 days
- 90 days

Then, our software will calculate the increasing and decreasing rate of change alarm levels and set them automatically. If you analyse your data and finds the alarm levels need slight adjustment this can be done manually.

This reading is only relevant when the system is undisturbed. For example, after an oil change, a positive condition change will be taken into account for the next Rate of Change period. Events such as cleaning may also cause large changes in the Rate of Change reading.

5.2.1.9. Warning & Alarm Levels

These determine when the Oil Status LED illuminates green, amber or red. You can set upper and lower limits for Oil Condition, Temperature and Rate of Change. These warning/alarms are optional and you can set the levels according to your specifications. The following table shows some typical settings for a range of applications:

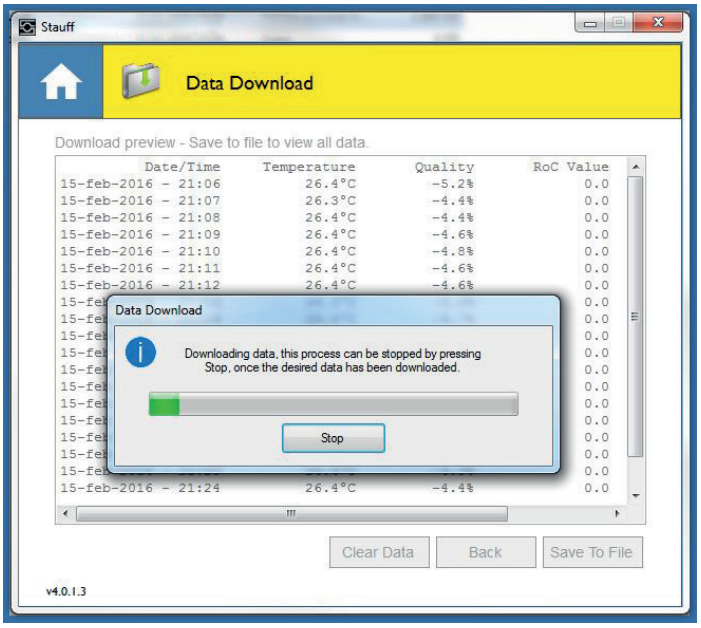
APPLICATION	WARNING (LOW)	ALARM (LOW)
For diesel engines, compressors, gear boxes and transformers	580 TDN	500 TDN
For hydraulics and gas engines	790 TDN	750 TDN

CADS displays “No sensor or Com port found”, shut down the software, unplug and then reconnect the USB cable and then re-start software

5.3. Data Download

5.3.1. OCS I-Display

To download a log file simply connect a laptop to the OCS I-Display via the configuration cable and launch CADS. From the Home Screen, select the ‘Data Download’ button, this will instantly start downloading data, beginning with the most recent log files. As shown in Figure 12, the data being downloaded is visible behind the status window, you can see the dates of the log files and stop the download when necessary.



5.4. Data Graphing

CADS can be used to plot a simple chart from a downloaded log file to show oil condition and temperature trends over time. From the CADS home screen click ‘View Datalog File’ and select the .tsv file you wish to view.

Once graph is plotted you can select the Oil Condition Unit (Tan Delta Number, Loss Factor, Oil Quality Index) and Temperature Unit (°C/°F).

6. Appendix

6.1. Oil Quality Conversion Chart

Oil quality is output as a Loss Factor Percentage and the output is linearly scaled between -20% (4mA) and +60% (20mA). The Loss Factor Percentage can easily be converted to the OQI scale using the following table.

4-20MA	LOSS FACTOR	TDN	ALARM SETTING
<4			
4 mA	-20.0 %	1200 TDN	
	-19.0 %	1200 TDN	
	-18.0 %	1200 TDN	
	-17.0 %	1200 TDN	
	-16.0 %	1200 TDN	
5 mA	-15.0 %	1200 TDN	
	-14.0 %	1180 TDN	
	-13.0 %	1160 TDN	
	-12.0 %	1140 TDN	High Alarm
	-11.0 %	1120 TDN	
6 mA	-10.0 %	1100 TDN	
	-09.0 %	1080 TDN	
	-08.0 %	1060 TDN	High Warning
	-07.0 %	1040 TDN	
	-06.0 %	1020 TDN	
7 mA	-05.0 %	1000 TDN	
	-04.0 %	0980 TDN	
	-03.0 %	0960 TDN	
	-02.0 %	0940 TDN	
	-01.0 %	0920 TDN	
8 mA	000.0 %	0900 TDN	
	001.0 %	0880 TDN	
	002.0 %	0860 TDN	
	003.0 %	0840 TDN	
	004.0 %	0820 TDN	
9 mA	005.0 %	0800 TDN	
	006.0 %	0780 TDN	
	007.0 %	0760 TDN	
	008.0 %	0740 TDN	
	009.0 %	0720 TDN	
10 mA	010.0 %	0700 TDN	
	011.0 %	0680 TDN	
	012.0 %	0660 TDN	
	013.0 %	0640 TDN	
	014.0 %	0620 TDN	
11 mA	015.0 %	0600 TDN	
	016.0 %	0580 TDN	
	017.0 %	0560 TDN	
	018.0 %	0540 TDN	
	019.0 %	0520 TDN	

4-20MA	LOSS FACTOR	TDN	ALARM SETTING
12 mA	020.0 %	0500 TDN	
	021.0 %	0480 TDN	
	022.0 %	0460 TDN	
	023.0 %	0440 TDN	
	024.0 %	0420 TDN	Low Warning
13 mA	025.0 %	0400 TDN	
	026.0 %	0380 TDN	
	027.0 %	0360 TDN	
	028.0 %	0340 TDN	
	029.0 %	0320 TDN	Low Alarm
14 mA	030.0 %	0300 TDN	
	031.0 %	0280 TDN	
	032.0 %	0260 TDN	
	033.0 %	0240 TDN	
	034.0 %	0220 TDN	
15 mA	035.0 %	0200 TDN	
	036.0 %	0180 TDN	
	037.0 %	0160 TDN	
	038.0 %	0140 TDN	
	039.0 %	0120 TDN	
16 mA	040.0 %	0100 TDN	
	041.0 %	0080 TDN	
	042.0 %	0060 TDN	
	043.0 %	0040 TDN	
	044.0 %	0020 TDN	
17 mA	045.0 %	0000 TDN	
	046.0 %	0000 TDN	
	047.0 %	0000 TDN	
	048.0 %	0000 TDN	
	049.0 %	0000 TDN	
18 mA	050.0 %	0000 TDN	
	051.0 %	0000 TDN	
	052.0 %	0000 TDN	
	053.0 %	0000 TDN	
	054.0 %	0000 TDN	
19 mA	055.0 %	0000 TDN	
	056.0 %	0000 TDN	
	057.0 %	0000 TDN	
	058.0 %	0000 TDN	
	059.0 %	0000 TDN	
20 mA	060.0 %	0000 TDN	

NUMBER RANGES	UPPER	LOWER	GRANULARITY
Loss Factor	060.0 %	-20.0 %	0.1
TDN	1200 TDN	0000 TDN	10

NUMBER FORMAT

Loss Factor = Always 4 characters (including -) to 1 decimal place

TDN = Always 4 digits

CONVERSION

4-20mA to Loss Factor = (mA - 4) * 5 - 20

4-20mA to TDN = (mA -17) * -100

6.2. Oil Temperature Analog Output

The table below shows how the oil temperature output (4-20mA) converts to temperature.

OCS OUTPUT 4.20MA VALUE		TEMPERATURE CONVERSION °C		°F	
MIN	MAX	MIN	MAX	MIN	MAX
20		130		266	
19.5	19.99	125	129	257	264.2
19	19.49	120	124	248	255.2
18.5	18.99	115	119	239	246.2
18	18.49	110	114	230	237.2
17.5	17.99	105	109	221	228.2
17	17.49	100	104	212	219.2
16.5	16.99	95	99	203	210.2
16	16.49	90	94	194	201.2
15.5	15.99	85	89	185	192.2
15	15.49	80	84	176	183.2
14.5	14.99	75	79	167	174.2
14	14.49	70	74	158	165.2
13.5	13.99	65	69	149	156.2
13	13.49	60	64	140	147.2
12.5	12.99	55	59	131	138.2
12	12.49	50	54	122	129.2
11.5	11.99	45	49	113	120.2
11	11.49	40	44	104	111.2
10.5	10.99	35	39	95	102.2
10	10.49	30	34	86	93.2
9.5	9.99	25	29	77	84.2
9	9.49	20	24	68	75.2
8.5	8.99	15	19	59	66.2
8	8.49	10	14	50	57.2
7.5	7.99	5	9	41	48.2
7	7.49	0	4	32	39.2
6.5	6.99	-5	-1	23	30.2
6	6.49	-10	-6	14	21.2
5.5	5.99	-15	-11	5	12.2
5	5.49	-20	-16	-4	3.2
4.5	4.99	-25	-21	-13	-5.8
4	4.49	-30	-26	-22	-14.8
<4		Fault			

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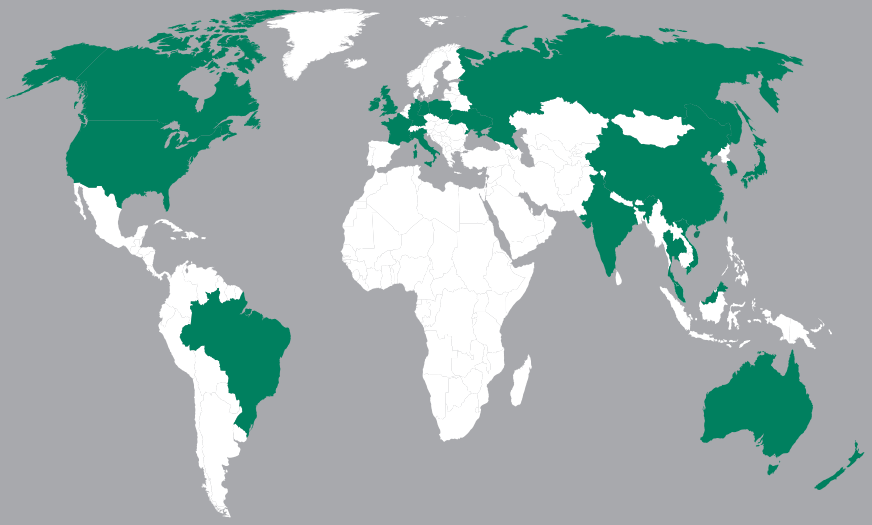

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